

Claims

1 1. A system for creating a customized drug library
2 for an electronically loadable drug infusion pump, said
3 system comprising:

4 a drug library containing a plurality of drug
5 entries, there being associated with each drug entry a set
6 of associated drug delivery parameters and/or drug delivery
7 protocols for configuring the drug infusion pump;

8 means for selecting a set of drug entries from among
9 said plurality of drug entries in said drug library;

10 means for adding the selected drug entries along
11 with the sets of drug delivery information associated
12 therewith to a customized library; and

13 loading means for causing the system to
14 electronically load said customized library into the drug
15 infusion pump.

1 2. The system of claim 1 wherein each of the
2 associated sets of drug delivery parameters includes
3 information selected from a group of parameters including
4 drug concentration, drug delivery rate, drug dose, and bolus
5 size.

1 3. The system of claim 2 wherein the said group of
2 parameters includes minimum, default and maximum drug
3 delivery rate.

1 4. The system of claim 2 wherein the said group of
2 parameters includes minimum, default and maximum dose.

1 5. The system of claim 2 wherein the said group of
2 parameters includes minimum, default and maximum bolus size.

1 6. The system of claim 2 wherein the said group of
2 parameters includes maximum bolus rate.

1 7. The system of claim 1 further comprising means
2 for creating a drug configuration within the customized
3 library that does not exist in the drug library.

1 8. The system of claim 1 further comprising means
2 for editing an existing drug configuration in the customized
3 library.

1 9. The system of claim 1 further comprising a
2 graphical tool that generates a graph for display on a
3 computer screen, said graph enabling the user to select an
4 appropriate drug concentration for a given body weight.

1 10. The system of claim 9 wherein said graph is a
2 two-dimensional log-log graph wherein one axis is body
3 weight and the other axis is fluid flow rate.

1 11. The system of claim 9 wherein one or more
2 curves are plotted on said graph, said one or more curves
3 being for a given drug concentration and different doses.

1 12. The system of claim 11 wherein the one or more
2 curves are of the form:

3
$$\text{Body Weight} = \text{Rate} \times \frac{\text{Concentration}}{\text{Dose}} \times K ,$$

4 where K is a positive number.

1 13. The system of claim 11 further comprising means
2 for moving said one or more curves about on said graph.

1 14. The system of claim 1 further comprising a list
2 of available mode options, means for identifying one or more
3 modes from said list of available mode options and means for
4 adding said identified modes to said customized library,
5 said modes specifying the units available for expressing the
6 drug delivery information and said identified modes being
7 the modes that will be available in the infusion pump when
8 said customized library is loaded into said infusion pump.

1 15. The system of claim 14 wherein said available
2 mode options include milliliter/hour, units/hour,
3 micrograms/minute, and micrograms/kilogram/minute.

1 16. The system of claim 1 further comprising a list
2 of names of syringe manufacturers, means for selecting names
3 of syringe manufacturers from said list of names of syringe
4 manufacturers and means for adding said selected names of
5 syringe manufactures to said customized library, said
6 selected names of syringe manufacturers identifying syringes
7 that can be used in the drug infusion pump when said
8 customized library is loaded into said infusion pump.

1 17. The system of claim 1 further comprising a list
2 of syringe sizes, means for one or more syringe sizes from
3 said list of syringe size and means for adding said selected
4 syringe sizes to said customized library, said selected
5 syringe sizes identifying syringes that can be used in the
6 drug infusion pump when said customized library is loaded
7 into said infusion pump.

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1 18. The system of claim 1 further comprising means
2 for representing a set of features within the customized
3 library, each of which can be toggled on or off, and means
4 for toggling on or off each of said features.

1 19. The system of claim 18 wherein said set of
2 features includes a drug library enable flag, wherein the
3 drug library enable flag either enables or disables,
4 depending upon the condition of the drug library enable
5 flag, access to the drug entries within the customized
6 library when the customized library is loaded into said drug
7 infusion pump.

1 20. The system of claim 18 wherein said set of
2 features includes a syringe recognition flag, wherein the
3 syringe recognition flag either enables or disables,
4 depending upon the condition of the syringe recognition
5 flag, a syringe recognition capability within said drug
6 infusion pump when the customized library is loaded into
7 said drug infusion pump.

1 21. The system of claim 18 wherein said set of
2 features includes a syringe detection flag, wherein the
3 syringe detection flag either enables or disables, depending
4 upon the condition of the syringe detection flag, a syringe
5 detection capability within said drug infusion pump when the
6 customized library is loaded into said drug infusion pump.

1 22. The system of claim 18 wherein said set of
2 features includes a volume limit detection flag, wherein the
3 volume limit flag either enables or disables, depending upon
4 the condition of the volume limit flag, a function within
5 the pump that enables the user to specify a volume limit for

6 a drug delivery configuration when the customized library is
7 loaded into said drug infusion pump.

1 23. The system of claim 1 further comprising means
2 for causing said system to read pump configuration
3 information from the drug infusion pump.

1 24. The system of claim 1 wherein said means for
2 selecting is normally disabled and said system further
3 comprises password protection logic that serves to enable
4 said selection means but only if a system user supplies a
5 preselected password to said password protection logic.

1 25. The system of claim 24 wherein there are
2 defined a plurality of access levels, each of said access
3 levels corresponding to a different set of access privileges
4 for said system and wherein said system further comprises a
5 table associating each of a plurality of users with a
6 corresponding one of said plurality of access levels and
7 wherein said password protection logic uses said table to
8 assign access privileges to the system user.

1 26. The system of claim 1 further comprising an
2 access control means for controlling access to said loading
3 means, wherein said access control means permits access to
4 said loading means if a system user satisfies a set of
5 preconditions and denies access to said loading means if the
6 system user fails to satisfy the set of preconditions.

1 27. The system of claim 26 wherein said access
2 control means comprises a sign-off table for recording a
3 sign-off and wherein said access control means permits
4 access to said loading means if a valid approval sign-off

5 exists in said sign-off table and denies access to said
6 loading means if a valid approval sign-off does not exist in
7 said sign-off table.

1 28. The system of claim 27 wherein the sign-off
2 table includes an system user name and a system user date
3 and time and an approval name and an approval date and time,
4 wherein said system user date and time records when a last
5 modification of said customized file by said system user
6 occurred and wherein said access control means permits
7 access to said loading means if said approval date and time
8 is later than said system user date and time and denies
9 access to said loading means if said approval date and time
10 is later than said system user date and time.

1 29. A system for use with a computer, said system
2 comprising:

3 a storage medium containing a drug library, said
4 drug library containing a plurality of drug entries, there
5 being associated with each drug entry a set of associated
6 drug delivery information for configuring a programmable
7 drug infusion pump, said storage medium being readable by
8 the computer,

9 a program that runs on said computer, said program
10 comprising:

11 means for enabling a user of said computer to select
12 a set of drug entries from among said plurality of drugs
13 entries in said drug library;

14 means for enabling the user to add the selected drug
15 entries along with the sets of drug delivery information
16 associated therewith to a customized library; and

17 means for enabling the user to cause said computer
18 to electronically load the customized library into the drug
19 infusion pump.

1 30. The system of claim 29 further comprising means
2 for enabling the user to create a drug configuration within
3 the customized library that does not exist in the drug
4 library.

1 31. The system of claim 29 further comprising means
2 for enabling the user to edit an existing drug configuration
3 in the customized library.

1 32. The system of claim 29 further comprising a
2 graphical tool that generates a graph for display on a
3 computer screen, said graph enabling the user to select an
4 appropriate drug concentration for a given body weight.

1 33. A drug infusion pump for use with a container
2 containing a particular drug, said pump comprising:
3 a drive mechanism for causing the particular drug to
4 be delivered to a patient from the container;
5 a programmable controller controlling the drive
6 mechanism;
7 an electronically loadable memory inside the pump;
8 input circuitry through which the electronically
9 loadable memory can be electronically loaded with a drug
10 library, said drug library containing a plurality of drug
11 entries, there being associated with each drug entry a set
12 of associated drug delivery parameters and/or drug delivery
13 protocols for configuring the drug infusion pump;
14 a user interface enabling a user to program the
15 programmable controller, said user interface comprising:

16 means for enabling the user to select a drug entry
17 from the electronically loaded drug library; and
18 means for configuring the programmable controller
19 with the set of drug delivery parameters associated with the
20 selected drug.

1 34. The drug infusion pump of claim 33 wherein said
2 container is a syringe and said drive mechanism operates
3 said syringe.

1 35. The drug infusion pump of claim 33 wherein said
2 electronically loadable memory is non-volatile memory.

1 36. The drug infusion pump of claim 35 wherein said
2 electronically loadable memory is EEPROM.

1 37. The drug infusion pump of claim 33 wherein said
2 user interface comprises a control panel through which the
3 user can program the programmable controller and a display
4 screen for displaying drug entries from the drug library.

1 38. The drug infusion pump of claim 33 wherein each
2 of the associated sets of drug delivery parameters includes
3 information selected from a group of parameters including
4 drug concentration, drug delivery rate, drug dose, and bolus
5 size.

1 39. The drug infusion pump of claim 38 wherein the
2 said group of parameters includes minimum, default and
3 maximum drug delivery rate.

1 40. The drug infusion pump of claim 38 wherein the
2 said group of parameters includes minimum, default and
3 maximum dose.

1 41. The drug infusion pump of claim 38 wherein the
2 said group of parameters includes minimum, default and
3 maximum bolus size.

1 42. The drug infusion pump of claim 38 wherein the
2 said group of parameters includes maximum bolus rate.

1 43. The drug infusion pump of claim 33 wherein said
2 electronically loaded drug library contains a list of
3 available mode options, said mode options specifying the
4 units available for expressing drug delivery information,
5 and wherein said drug infusion pump offers the user the list
6 of available mode options from which to make a selection
7 when the electronically loaded drug library is in said pump.

1 44. The drug infusion pump of claim 43 wherein said
2 list of available mode options includes selection made from
3 the group including milliliter/hour, units/hour,
4 micrograms/minute, and micrograms/kilogram/minute.

1 45. The drug infusion pump of claim 33 wherein said
2 electronically loaded drug library contains a list of names
3 of syringe manufacturers, said names of syringe
4 manufacturers identifying syringes that can be used in the
5 drug infusion pump, and wherein said drug infusion pump
6 offers the user the list of names of syringe manufacturers
7 from which to make a selection when the electronically
8 loaded drug library is in said pump.

1 46. The drug infusion pump of claim 33 wherein said
2 electronically loaded drug library contains a list of
3 syringe sizes, said selected syringe sizes identifying
4 syringes that can be used in the drug infusion pump, and
5 wherein said drug infusion pump offers the user the list of
6 syringe sizes from which to make a selection when the
7 electronically loaded drug library is in said pump.

1 47. The drug infusion pump of claim 33 wherein said
2 electronically loaded drug library contains a set of
3 features, each of which is either be toggled on or off, and
4 wherein said drug infusion pump offers the user only the
5 features from among the set of features that are toggled on
6 when the electronically loaded drug library is in said pump.

1 48. The drug infusion pump of claim 47 wherein said
2 set of features includes a drug library enable flag, wherein
3 the drug library enable flag either enables or disables,
4 depending upon the condition of the drug library enable
5 flag, access to the drug entries within the drug library in
6 said drug infusion pump.

1 49. The drug infusion pump of claim 47 wherein said
2 set of features includes a syringe recognition flag, wherein
3 the syringe recognition flag either enables or disables,
4 depending upon the condition of the syringe recognition
5 flag, a syringe recognition capability within said drug
6 infusion pump when the drug library is in said drug infusion
7 pump.

1 50. The drug infusion pump of claim 47 wherein said
2 set of features includes a syringe detection flag, wherein
3 the syringe detection flag either enables or disables,

4 depending upon the condition of the syringe detection flag,
5 a syringe detection capability within said drug infusion
6 pump when the drug library is in said drug infusion pump.

1 51. The drug infusion pump of claim 47 wherein said
2 set of features includes a volume limit detection flag,
3 wherein the volume limit flag either enables or disables,
4 depending upon the condition of the volume limit flag, a
5 function within the pump that enables the user to specify a
6 volume limit for a drug delivery configuration when the drug
7 library is loaded in said drug infusion pump.

1 52. A drug infusion pump for use with a container
2 containing a given drug, said container including a machine
3 readable label, the label specifying an identifier of the
4 given drug and possibly other information about the given
5 drug, said pump comprising:

6 a drive mechanism for causing the given drug to be
7 delivered to a patient from the container;

8 a programmable controller controlling the drive
9 mechanism;

10 a memory for storing a drug library, said drug
11 library containing a plurality of drug entries, there being
12 associated with each drug entry a set of associated drug
13 delivery parameters for configuring the drug infusion pump;

14 a label reader for reading the contents of the label
15 on the container;

16 means responsive to the label reader for identifying
17 an entry in the drug library that corresponds to the given
18 drug;

19 means for configuring the programmable controller by
20 using the set of drug delivery parameters associated with
21 the identified entry from the drug library; and

22 means for causing the controller to run the drive
23 mechanism using the set of drug delivery parameters
24 associated with the identified entry from the drug library.

1 53. The drug infusion pump of claim 52 wherein said
2 container is a syringe and said drive mechanism operates
3 said syringe.

1 54. The drug infusion pump of claim 52 wherein said
2 machine readable label is a touch memory.

1 55. The drug infusion pump of claim 52 wherein said
2 configuring means also uses information from said label to
3 configure the programmable controller.

1 56. The drug infusion pump of claim 52 wherein the
2 label includes an expiration date for the given drug and
3 wherein said pump further comprises:

4 an internal clock indicating a current date;
5 means for comparing the expiration date as read by
6 the label reader to the current date as indicated by the
7 internal clock; and

8 means for issuing a warning if the current date is
9 later than the expiration date.

1 57. The drug infusion pump of claim 56 further
2 comprising means for preventing the controller from running
3 the drive mechanism if the current date is later than the
4 expiration date.

1 58. A drug infusion pump for use with a container
2 containing a given drug, said pump comprising:

3 a drive mechanism for causing the given drug to be
4 delivered to a patient from the container;
5 a programmable controller controlling the drive
6 mechanism;
7 a memory containing an event log;
8 means for configuring the programmable controller to
9 deliver the given drug in accordance with a set of drug
10 delivery parameters;
11 a user interface for operating the pump;
12 and
13 means for creating in the event log a sequence of
14 event records, each event record documenting a different
15 event in the operation and/or programming of the pump.

1 59. The drug infusion pump of claim 58 wherein the
2 events that are recorded in said event log include
3 occurrences of alarms, said alarms warning of a problem
4 requiring user attention.